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THE STUDY OF THE PHYSICS OF COMETARY NUCLEI

10P

Grant NSG 7082

Final Report

For the period 1 September 1974 through 30 April 1991

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Principal Investigator
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Final Report
NSG-7082
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F. L. Whipple

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Gentlemen:

Transmitted herewith are two (2) copies of the subject report for the period
1 September 1974 through 30 April 1991 in accordance with the provisions of

viable in most cases because of multiple regions of activity on a comet's nucleus but proved valuable for comets Donati (1858 VI), P/Schwassmann-Wachmann 1 (P/SW) and P/Holmes. For comet P/SW a thorough analysis gave not only the period of rotation but also the axis.

With Sekanina, the study of the short-period comet Encke led to a measure of the precession of the rotation axis and an analysis of the great change in the non-gravitational forces over the nearly 200 years of observation.

A major computational effort involving the wasting and ejection forces of sublimating material from comets, tended eventually to orient the rotation pole normal to the orbital plane about the Sun. Because this result is contrary to the observations, the results still remain a puzzle in terms of comet aging.

Several studies over the years have combined to indicate the non-homogeneity of cometary nuclei on a small scale ($\lambda < 1$ km) but somewhat uniform composition and structure on a large scale except for effects of cosmic-rays acting on the outer layers of "new" comets in the Oort Cloud.

With various other authors Whipple has contributed to a number of papers analyzing the Giotto imaging of Halley's comet in its 1986 apparition. These involve new results concerning the dimensions, shape and albedo of the nucleus

as well as great advances in understanding the nature of comet activity and the true character of comets.

Other Activities Over these years, Whipple served almost continuously on national and international committees proposing and describing space missions to comets including in recent years the Imaging Team of the Giotto Mission to Halley's Comet, the International Halley Watch, the Inter-agency consultative Group of Solar-System space research, and the Scientific Program Committee of the 20th ESLAB Symposium on Halley's Comet. He also served for several years on the Planetary and Lunar Exploration Committee (COMPLEX) for the U.S. National Academy of Sciences Space Science Board and has made a number of presentations to the National Academy and to NASA.

His bibliography lists a number of summary articles on comets that have served a wide international audience.

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The Study of the Physics of
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1 September 1974 through 30 April 1991

Fred L. Whipple

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